

## **JOINT FIRE SCIENCE PROGRAM RESEARCH ACCOMPLISHMENT REPORT**

### **1. TITLE OF PROJECT:**

Evaluating the effects of prescribed fire and fuels treatment on water quality and aquatic habitat

### **2. RESEARCH UNIT:**

Umatilla National Forest

### **3. FIELD LOCATION / STUDY SITES:**

Blue Mountains, NE Oregon & SE Washington

### **4. JFSP PROJECT NUMBER:**

01-3-3-18

### **5. TEAM LEAD SCIENTIST AND CONTACT INFORMATION:**

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### **6. PROJECT OVERVIEW: (Short paragraph describing your research project – providing some background information and the approach taken)**

This study is designed to examine the effects of prescribed fire and mechanical fuel treatments on surface erosion, stream sedimentation, channel morphology, and other water quality parameters. Analysis of three years of post-treatment data on hillslope erosion in the Red Fir study site indicate no significant difference in erosion rates in prescribed burn sites compared to controls. Erosion rates were significantly related to topographic factors including aspect. Mechanical soil disturbance by wildlife (elk and rodents) appeared to be an important factor influencing erosion rates over the time-scales and under the climatic and disturbance regimes examined in this study. More than 10 years of background hydrologic data are now available and being archived for the Skookum Experimental Watersheds. Measurements from these paired watersheds, gauged since 1992, include stream discharge, sediment yield, water temperature, and channel morphology. We installed hillslope erosion plots in 2002 to compare treatment and control erosion and sediment delivery rates, and develop watershed scale erosion budgets. Planned treatments were not implemented within the timeframe of this study. However, the detailed background measurements characterize variability of hillslope erosion rates, stream discharge, and sediment yields. Analysis of hillslope erosion and watershed sediment yields indicate highly episodic rates of sediment delivery to channels and variable transport and storage processes related to climatic, topographic, and vegetative factors. A second prescribed fire and mechanical treatment project, the Lick Project, was implemented in the fall of 2004. Hillslope erosion plots were installed within one week of the prescribed fire on 3 treatment plots and 1 control plot. Treatments included: burn only, commercial yard combined with burning (where only commercial logs are removed from the site

and slash is left in place), and fuels yard combined with burning (where the slash from harvesting was piled and chipped). Initial samples were collected in the spring of 2005, and are now being analyzed.

Results from this study will be used to refine erosion and sediment delivery models used in planning and assessing prescribed fire and fuels treatment activities. All data collected in this study through 2004 are being archived in the Pacific Northwest Research Station databank (data have been delivered to PNW databank managers). Final results from 2005 will be analyzed and archived in the winter of 2005-2006, and a final project report completed by February, 2006.

## 7. ACCOMPLISHMENTS:

(Bullet statements describing the accomplishments to date. Include information about preliminary results, products developed and metrics used to measure success.)

- Established four hillslope erosion plot study areas with a total of 126 erosion plots
- Prescribed burning treatments were implemented in two study areas
- Installed 10 rain gauges (located at each hillslope study area)
- Measured fuel loads at three study areas at plot scale
- Completed 2 ½ years of erosion plot sampling in one study area and ½ year in second
- Completed laboratory processing of more than 80% of the collected erosion plot samples
- Compiled 13 years of historical data for the Skookum Experimental Watershed
- Re-established and surveyed channel reference reaches in the control and treatment watersheds on Skookum Creek
- Completed major maintenance on the stream gauges at the Skookum Experimental Watershed

## Findings include:

- Hillslope erosion rates varies with aspect. South aspects have significantly higher background erosion rates.
- Sediment delivery to valley floors and stream channels appears to be small compared to sediment yields from watersheds, suggesting hillslope and valley floor storage mechanisms, and episodic transport processes.
- High annual variability of natural background water and sediment yields (with sediment varying an order of magnitude) may mask treatment effects. Climate and vegetation conditions strongly influence inter-annual variability.
- Two year post-treatment results showed low overall hillslope erosion rates.
- Rapid post-fire vegetative recovery and absence of intense storms during the first two years following treatment likely accounts for low observed erosion rates.
- In the absence of significant precipitation events, hillslope erosion may be more related to local factors including wildlife (elk and rodent) impacts.

#### 8. APPLICATION AND TECHNOLOGY TRANSFER:

(Describe how your research is being used and how it will help address wildland fire management issues. Include information about how are you transferring information to managers and field user groups)

Results from analysis of background data and prescribed fire treatment effects will be used to help analyze effects from future projects, refine erosion models, and monitor long term project effectiveness.

Baseline data on the following watershed attributes: hillslope erosion, stream discharge, sediment loads and concentrations, water temperature, and channel morphology will be used to characterize background conditions and understand controlling factors at multiple spatial (hillslope to landscape) and temporal (seasonal to annual) scales. Post-treatment results help identify specific processes and timing of erosion, and controlling factors at the hillslope scale. These results will be used to estimate project-level effects from future prescribed burn and fuel treatment projects. Results will also be used to locally calibrate predictive models such as WEPP. Overall, results will support quantification of the effects of treatments compared to natural background and wildfire effects. Information is being transferred to managers through various mechanisms including informal exchange – this project is managed on the Umatilla National Forest by local staff, which helps facilitate rapid exchange of information to local users.

#### 9. PICTURES:

Please send any pictures that we could use in the annual Business Summary Report. Photos must be at least 300 DPI preferably in TIF or GIF format. Please do not send them imbedded in a Word or PowerPoint document. Photo credits must be included for all photos.

#### 10. LINKAGES AND OTHER FUNDING SOURCES:

- a. NFP RESEARCH FUNDING - (NFP project number and % of funding): 0%
- b. OTHER (% of funding from other sources): 30%

11. RESEARCH METRICS: Please provide the requested information below, which the JFSP program office uses to answer other accomplishment questions.

**Cumulative**  
**(Initiation of project through 7/15/05)**

**Outputs:**

Scientific Outputs:

No. of refereed publications	___1___
No. of non-refereed publications	___0___
No. of Presentations at scientific conferences	___6___

Technology Transfer Products:

No. of User Bulletins, Leaflets etc.	___1___
No. of Decision Support Tools/ Models Developed/Implemented	___0___
No. of Demonstrations/Tours Provided	___2___

Technical Assistance:

No. of Significant Consultations	
With Agency units	___1___
With States	___1___
With Tribal governments	___2___
With County, local governments	___0___
Other (specify)	

No. of Short courses/Training Programs/ Workshops given	___0___
Total number of attendees of short courses/ Training Programs/Workshops given	___0___

No. of Fire Management Units Assisted	___1___
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